

**REMARKS**

Claims 1, 3-4, 6-7 and 12-19 were pending in the present application. Claims 1, 3-4, 6-7 and 12-19 stand rejected. By virtue of this response, no claims are cancelled, amended, or added. Accordingly, claims 1, 3-4, 6-7 and 12-19 are currently under consideration. Amendment and cancellation of certain claims is not to be construed as a dedication to the public of any of the subject matter of the claims as previously presented.

**Rejections under 35 U.S.C. §103(a)**

Claims 1, 3-4, 6-7, 12-19 are rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Kimura et al. (6,201,823), in combination with Zauner et al. (publication by Material Research Society).

Applicants submit that Zauner et al. is not prior art to the present application. The publication date of the Zauner et al. article as cited by the Examiner includes a copyright date of 2000. Applicants contacted the publisher of the article, the Material Research Society, which determined the publication date as May 13, 2000 (see email attached hereto as Appendix A). Since the application date of the priority document of the present application is January 14, 2000 the Zauner et al. reference is not prior art to the present application. Accordingly, the rejection on these grounds should be withdrawn.

Applicants also have submitted herewith, (in Appendix B) an Abstract of the Zauner et al. reference, having a date of November 28 to December 3, 1999. Applicants submit that the present claims are allowable over the Zauner Abstract (as well as the Zauner article) for at least the following reasons.

The Abstract discloses crystal planes which are different than those presently recited by the claims. In particular, the Abstract discloses a GaN (0001) plane (“the so called Ga-side”), wherein growth on Ga-side leads to “smooth and transparent films.” Further, the Abstract goes on to describe (in the next line) that a GaN (000-1) direction (i.e., the N-side, which is the plane

opposite the Ga side), the layer is tending to form “hexagonal pyramids.” Such projections, e.g., the hexagonal pyramids, are a macroscopic undulation and, as described herein, are typical of the surface of a nitride semiconductor formed on the (000-1) plane (i.e., the N side). Thus, such macroscopic undulation is not observed on the Ga-side or surface, e.g., on the (0001) plane as recited by the present claims.

In other words, the problem of undulation in  $\mu$  size, which is discussed in the cited reference, does not exist on the (0001) plane as presently recited. As described above, Zauner itself describes that the (0001) plane (i.e., the Ga side) is a smooth and transparent film. Therefore, at the very least, Zauner does not provide any motivation or suggestion for the combination of references because Zauner is directed to a different crystal plane which has markedly different physical properties than the (0001) plane as presently recited. Accordingly, for at least these reasons, the combination of references does not fairly disclose or suggest the features of the present claims. In fact, the combination at best would suggest a device with features relating to the N side, (000-1) plane, but not the Ga side, (0001) plane.

The Examiner further states:

“Zauner particularly teaches obtaining smoother layers due to suppression of formation of hexagonal pyramids of GaN growth because GaN is grown on GaN substrate with off-angle orientation from <000-1> direction or inherently <0001> (see abstract and the introduction section).” (Emphasis added).

The Examiner is incorrectly relying on inherency in the rejection. As described herein and in the disclosure by Zauner itself, the (0001) plane (i.e., the Ga side) is not the same as the (000-1) plane (i.e., the N side). In addition to the two planes being on different sides (e.g., front plane and rear plane), the two planes are physically different as clearly described by the Zauner abstract and it is clearly incorrect to equate or consider disclosure of one plane as inherently disclosing the other plane. For example, the undulation, which the present application considers as an issue, is characteristically different from the macroscopic undulation in the shape of a hexagonal pyramid as clearly described by Zauner. As explained with respect to Figs. 2 and 3, the present application is concerned with undulations (steps) having a height on the order of atomic layers. For example,

page 15, line 25 to page 19, line 12 in the detailed description discusses the flatness of undulation on the order of layers (a two-dimensional growth mode in which a layer by layer planar growth occurs). The reason why flatness of the plane on the order of such atomic layers is required is that it is necessary to make the composition of In contained in a light emitting layer (especially a well layer) uniform. (See, e.g., page 18, line 14 to page 19, line 12 in the detailed description).

Furthermore, the abstract of Zauner discloses that a surface morphology can be improved by making a GaN substrate having a (000-1) plane with a sufficiently large off-angle (2° and 4°). On the other hand, a preferred off-angle in a (0001) plane shown in the present application, is greater than or equal to 0.05° and less than or equal to 2°. The detailed description of the present invention describes that the characteristics drastically deteriorate when the off-angle exceeds 2°. As such, the ranges of the off angle disclosed in Zauner and the off-angle in the present application are obviously different, in part, because the problems posed by the undulation found in a (0001) plane and undulation in a (000-1) plane are different (as recognized by the Zauner reference itself).

Therefore, Applicants submit that the combination of Kimura and Zauner clearly fails to teach each and every feature of claim 1, and further there is no teaching, suggestion, or motivation to combine the references to meet the features of the present claims. Accordingly, Applicants respectfully request withdrawal of the rejection and allowance of claims 1, 3-4, 6-7, and 12-19.

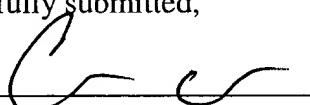
## CONCLUSION

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of the claims and to pass this application to issue. If it is determined that a telephone conference would expedite the prosecution of this application, the Examiner is invited to telephone the undersigned at the number given below.

In the event the U.S. Patent and Trademark office determines that an extension and/or other relief is required, applicant petitions for any required relief including extensions of time and authorizes the Commissioner to charge the cost of such petitions and/or other fees due in connection with the filing of this document to Deposit Account No. 03-1952 referencing docket no. 299002051800. However, the Commissioner is not authorized to charge the cost of the issue fee to the Deposit Account.

Dated: July 25, 2005

Respectfully submitted,

By   
Christopher B. Eide

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**Eide, Christopher B.**

**From:** Brennan, John P.  
**Sent:** Tuesday, June 07, 2005 1:02 PM  
**To:** Eide, Christopher B.  
**Subject:** FW: FW: Publication date of a volume of MRS Internet Journal of Nitride semiconductor research

fyi

-----Original Message-----

**From:** Eric Hellman [mailto:[eric@openly.com](mailto:eric@openly.com)]  
**Sent:** June 07, 2005 11:52 AM  
**To:** Michael Driver  
**Cc:** Brennan, John P.  
**Subject:** Re: FW: Publication date of a volume of MRS Internet Journal of Nitride semiconductor research

This article was presented as part of Symposium W, "Gallium Nitride and Related Alloys" at the 1999 Fall Meeting of the Materials Research Society held in Boston, Massachusetts, November 28-December 3

The web version was available May 17, 2000- I believe the printed proceedings volume was made available prior to that date.

At 2:15 PM -0400 6/7/05, Michael Driver wrote:

Eric,

Do you know the answer to this one?

Mike

Michael C. Driver PhD

Director of Information Services

Materials Research Society

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**From:** Brennan, John P. [mailto:[JBrennan@mofo.com](mailto:JBrennan@mofo.com)]  
**Sent:** Tuesday, June 07, 2005 12:32 PM  
**To:** Michael Driver

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I left you a voice mail last week but haven't received a call back. If you are the wrong person to ask about this information, please direct me to someone who can help. Thank you.

John Brennan

<http://nsr.mij.mrs.org/5S1/>

4/7/2 (Item 2 from file: 34)  
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci  
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09149953 Genuine Article#: 368DZ Number of References: 12  
Title: Homo - epitaxial growth on misoriented GaN substrates by MOCVD  
Author(s): Zauner ARA (REPRINT) ; Schermer JJ; vanEnckevort WJP; Kirilyuk  
V; Weyher J; Grzegory I; Hageman PR; Larsen PK  
Corporate Source: CATHOLIC UNIV NIJMEGEN,MAT RES INST/NL-6525 ED  
NIJMEGEN//NETHERLANDS/ (REPRINT); POLISH ACAD SCI,HIGH PRESSURE RES  
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ISSN: 1092-5783 Publication date: 20000000  
Publisher: MATERIALS RESEARCH SOCIETY, 506 KEYSTONE DR, WARRENDALE, PA  
15086

Language: English Document Type: ARTICLE  
Abstract: The N-side of GaN single crystals with off-angle orientations of 0 degrees, 2 degrees, and 4 degrees towards the [10 (1) over bar0] direction was used as a substrate for homo - epitaxial MOCVD growth. The highest misorientation resulted in a reduction of the density of grown hillocks by almost two orders of magnitude as compared with homo - epitaxial films grown on the exact (000 (1) over bar) surface. The features still found on the 4 degrees misoriented sample after growth can be explained by a model involving the interaction of steps, introduced by the misorientation and the hexagonal hillocks during the growth process.

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John Brennan

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4/7/2 (Item 2 from file: 34)

DIALOG(R)File 34:SciSearch(R) Cited Ref Sci  
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09149953 Genuine Article#: 368DZ Number of References: 12

Title: Homo - epitaxial growth on misoriented GaN substrates by MOCVD

Author(s): Zauner ARA (REPRINT) ; Schermer JJ; vanEnckevort WJP; Kirilyuk  
V; Weyher J; Grzegory I; Hageman PR; Larsen PK

Corporate Source: CATHOLIC UNIV NIJMEGEN,MAT RES INST/NL-6525 ED  
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ISSN: 1092-5783 Publication date: 20000000

Publisher: MATERIALS RESEARCH SOCIETY, 506 KEYSTONE DR, WARRENDALE, PA  
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Language: English Document Type: ARTICLE

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